Statement of
John MacDonald
Chairman of the Board of Control
Bechtel/Parsons Brinckerhoff
Committee on Government Reform
U.S. House of Representatives
April 22, 2005

The Boston Central Artery/Tunnel Project (CA/T) is the largest and most complex urban transportation project ever undertaken in the United States. Dubbed the "Big Dig" by Bostonians, it is the result of more than 30 years of planning and 14 years of construction to replace the elevated section of the Interstate 93 Central Artery through downtown Boston with a much wider underground highway, and to extend the Interstate 90 turnpike to Logan Airport via a third harbor tunnel. The Big Dig ranks on a scale with the Panama Canal and the Channel Tunnel.

When completed in the coming months, CA/T will comprise 161 lane-miles of interstate highway—over half underground. Its host of civil engineering firsts include the world's widest cable-stayed bridge, the deepest underwater connection in North America, state-of-the-art freeway segments built only inches above old public transit railways, an extensive deep-soil-mixing program to stabilize Boston's historic soils during construction, and an unprecedented ground freezing system to allow jacking of full-size highway tunnel sections. The project has already been widely recognized through dozens of awards for engineering and aesthetics.

Perhaps most remarkable, millions of residents and visitors have enjoyed continued access to the city during more than a decade of construction starting in 1991. Through it all, Boston's downtown financial and commercial district has stayed open for business and the needs of residential neighborhoods have been addressed. Now within months of completion, this engineering marvel will enable Boston and the state of Massachusetts to meet their critical transportation needs in the 21st century with a great sense of civic satisfaction and pride.

These major accomplishments have come at a significant cost—now estimated at $14.6 billion for completed construction. The price tag rose dramatically over more than two decades as the project was enlarged, redefined, and portions even put on hold by state officials to meet the many often-conflicting concerns of Boston's downtown business community, neighborhood and environmental groups, adjacent landowners, taxpayer groups, and federal agencies.

The Big Dig's cost has raised many questions over the years. Most recently, leaks and wall defects in the I-93 tunnels have also generated concerns. My statement to the Committee will:

- clarify the roles and responsibilities of the management consultant, Bechtel/Parsons Brinckerhoff (B/PB);
- place the Big Dig's cost growth in historical, political, and economic context;
- review the project's program to identify and remedy leaks and wall defects; and
- offer a reminder of the many reasons why Democrats and Republicans, business and community groups, local residents and national transportation experts, have come together to support this project over many years.

Managing a Megaproject: Roles and Responsibilities

As the management consultant retained by the Massachusetts Highway Department (MHD) in 1985, B/PB, a joint venture of Bechtel Corporation and Parsons Brinckerhoff Quade & Douglas, Inc., has helped manage the Big Dig according to widely accepted industry standards. As specified in 16 separate contracts, B/PB has been responsible for:

- providing preliminary design services;
- managing the performance of the final designers of record;
- managing the construction work of the various contractors;
- reporting on the project's overall cost and schedule to the Massachusetts Turnpike Authority, or MTA (which took over from MHD in 1997); and
- providing recommendations to MTA for decision making and, when asked, acting as MTA's representative

Throughout the life of the project, the state has determined what gets built, when, and for how much. B/PB has developed alternatives and provided its professional recommendations on the most practical, cost-effective solutions but has not been empowered to choose among them. The quality of B/PB's work has been well-documented in ongoing evaluations and oversight by state and federal agencies, including MTA, MHD, and the Federal Highway Administration (FHWA).

The biggest change in B/PB's role as management consultant occurred in 1998, when MTA combined key B/PB personnel with those of the state in an Integrated Project Organization. MTA's goal was to streamline project management and decision-making and efficiently move the project from the design phase to construction.

Growth in Project Cost

The concept of the Big Dig, as it took shape in the 1970s and early 1980s, reflected the conviction of Boston-area leaders and public officials that the old Central Artery, the most congested roadway in America, was nearing the end of its operational life. The multiyear job of redecking or even replacing it threatened to strangle the city by disrupting traffic in and around the city of Boston. The alternative concept of using "slurry wall" construction methods to build a new underground artery while keeping the old roadway open in the interim, proposed by the state Transportation Department, offered a way to free the city from gridlock in the long run without bringing its economy to a standstill in the short run.

The initial cost estimate of $2.6 billion dated back to 1985, before B/PB was hired, and was based on a preliminary concept developed by state officials before detailed technical studies had been undertaken. In the years that followed, state officials followed a deliberate and time-consuming process of consulting with various interest groups, negotiating settlements to lawsuits, and modifying project plans to minimize real or perceived harm to the Boston community. This process made the design more sensitive to community needs and increased public acceptance, but the resulting mitigation measures made the project much more expensive to design and build. With every extension of the project schedule, inflation took a bigger bite. Local concerns were minimized by the fact that the federal government, at least in the early years, was covering up to 90 cents on the dollar through the Interstate Highway Program.

As a result of this process, the cost of the Big Dig has always been a moving target. For example, state officials significantly shifted the configuration of a proposed tunnel in Fort Point Channel in response to objections from a large manufacturer and to take account of federal wetlands and historic preservation rules. The new route in turn required a host of mitigation discussions and measures to satisfy affected businesses and landowners.

To take account of local concerns in East Boston, the proposed airport interchange was redesigned in 1987 and then again in 1988, only to provoke the ire of an exceptionally vocal and determined owner of an off-airport parking lot. The state did not succeed in resolving his demands until 1991.

The Charles River Crossing—required to connect the Central Artery with four other roadways—triggered an even longer debate over concept and design. B/PB engineers and state officials analyzed more than 50 separate design alternatives in an effort to satisfy opposition from a host of groups, including the state's own Metropolitan District Commission and the city of Cambridge. The final concept was not approved by state officials until 1994—11 years after it was officially proposed in the first Environmental Impact Report—at an added cost of a billion dollars.

In all, according to state officials, the project undertook more than 1,500 separate mitigation agreements, accounting for at least one-third of the CA/T project's total costs. The most authoritative history of the project concluded that "what stands out most strikingly is the extraordinary difficulty and expense, yet supreme importance, of consensus-building." The study's authors, Harvard University scholars Alan Altschuler and David Luberoff, argued that "the most powerful explanatory factor" behind the rising cost of the Big Dig was

> a new paradigm (i.e. conceptual frame) that the state adopted for resolving conflicts between project beneficiaries and those negatively affected by project construction. . . . The traditional view was that large projects inevitably harm some bystanders, but that their self-interested objections should not be allowed to block the realization of broad public benefits—or indeed to drive up costs significantly. . . . Public projects are now subject to a multitude of environmental, citizen participation, and other regulations, and are far more vulnerable to legal challenges. As one consequence many fewer large public works projects go forward; but as another those which do are far more expensive—since their budgets include larger, often vastly larger, amounts for mitigation and compensation.[1]

Specific Cost Drivers

B/PB, working with state officials, has analyzed in much greater detail the specific drivers of cost growth on the project. This analysis shows that the single biggest contributor to rising costs was inflation, which by the end of the project will have added $6.4 billion to the original cost estimate made in the early 1980s. That sum alone is more than half the difference between the original estimate and projected final cost. Following federal rules, the original cost estimate included no allowance or calculation for inflation.

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[1] David Luberoff and Alan Altschuler, *Mega-Project: A Political History of Boston's Multibillion Dollar Artery/Tunnel Project* (Cambridge, MA: John F. Kennedy School of Government, Harvard University, Rev. ed., April 1996)., VI-6 to VI-8. Such factors affect many other large projects as well, leading the authors to note in another study that dramatic cost escalation of the kind seen on the Big Dig is "not out of the ordinary for a major highway project." See Altschuler and Luberoff, *Megaprojects: The Changing Politics of Urban Public Investment* (Washington, D.C.: Brookings Institution, 2003), 116-117, citing the examples of Century Freeway and Woodrow Wilson Bridge.

Other key cost drivers (shown in current dollars) include:

1. Major growth in project scope and traffic maintenance added $2.7 billion to project costs. Some major costs that were not part of the 1982 concept include:
   - Rebuilding the Dewey Square Tunnels
   - Adding new interchanges at Logan Airport and Massachusetts Avenue
   - The use of more complex construction methods required for the Fort Point Channel Tunnel
   - The roofing of open-air tunnels in South and East Boston
   - Building of temporary ramps to maintain traffic flow during construction

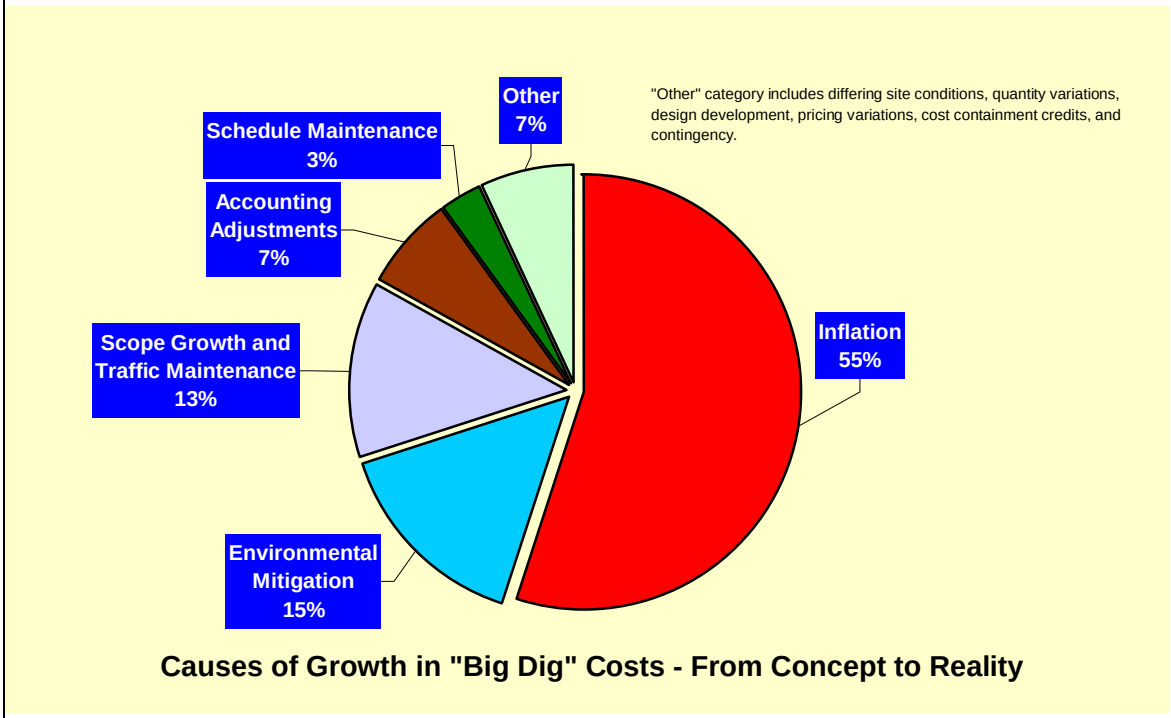
2. Environmental compliance and mitigation increased project cost by $3 billion. Examples included:
   - Redesigning the Charles River Crossing
   - Disposing of material on Spectacle Island instead of in the waters of Boston Harbor to develop a public park
   - Adding high-occupancy vehicle lanes to the Interstate 90 and 93 alignments

3. Accelerating the construction schedule cost some $600 million. In 1995, MHD decided to increase the pace of the project after B/PB reported that trends pointed to a serious slippage in its future schedule. Paying for more workers, more equipment, and more work shifts cost the project about $600 million. As a result, the project's completion date has slipped only nine months in 11 years.

4. Accounting adjustments added $1.2 billion, reflecting changes in government guidelines for allocating costs. For example, until 1999, MTA showed an insurance credit of up to $800 million as an offset to the overall project cost. In 2000, after several years of recognizing the credit, the U.S. Department of Transportation disallowed this offset, effectively adding $800 million to the project's price tag.

Figure 1 shows the relative contribution of these and other factors to the overall growth in project cost estimates:

Figure 1



Cost Estimating and Disclosure

The process of developing cost estimates on the Big Dig was necessarily evolutionary. It is not possible at the beginning of such a large, lengthy, and complex project to anticipate, with precision, all final design and program decisions that will be made by the state and other interested parties, as well as the extent and nature of unanticipated conditions that impact cost and schedule. Nor is it possible to predict, with accuracy, the fluctuating bid climate and related market conditions that may exist throughout the life of a long project. As decisions were made and conditions evolved on the Big Dig, however, B/PB factored them into its cost assessments and kept the client fully informed, even in the face of strong political pressures.

In 1994, B/PB provided the governor and state officials with a total cost estimate of almost $14 billion to complete the project. MHD (and later MTA), under federal and state pressure to hold the line on project costs, was determined to maintain a total cost of $7.7 billion (about $10.4 billion counting inflation and third-party payments). It instructed B/PB to recommend scope reductions where possible and initiate cost containment and other efforts to offset any cost increases with cost savings. Then and later, the state transportation secretary's office forcefully reminded B/PB that responsibility for public discussion of project issues rested exclusively with the public officials managing the project, and that the contract prohibited B/PB from making any unauthorized statements to the public.

While advising that it would be very difficult to hold the line, B/PB worked aggressively with MHD and MTA to recommend and implement savings and cost containment measures necessary

to meet the state's objectives. By 2000, however, project scope changes, contractor claims, rising construction costs, and changes in allowable accounting practices made it impossible for MTA to maintain its zero-budget-growth mandate. MTA's chairman announced a revised cost estimate of $12.2 billion (including inflation). The new figure proved highly controversial, and various public officials as well as the media moved quickly to assign responsibility for what was widely termed a "cost overrun."

The Inspector General of Massachusetts stated in 2001 that "B/PB insisted upon and, in fact, made full disclosure to local FHWA officials of each exclusion, deduction, and accounting assumption" used in the project's cost estimates.

Cost Control

The full story of spending on the Big Dig would record the creative and sustained efforts by project personnel to save money and maximize value to taxpayers. Effective cost control starts with systems and practices that facilitate accurate and timely cost reporting. B/PB developed a state-of-the-art Construction Information System to track individual contract tasks, change orders, and other data used in the assembly of project cost reports for MTA.

Combining this information with insights from years of engineering experience, B/PB developed and recommended innovative cost-containment concepts that have saved close to $1.7 billion over the life of the project with the assistance of MHD, MTA, and FHWA. They include:

1. Savings of $480 million from value engineering. B/PB gathered independent third-party experts from around the world to review designs, ask questions, and make suggestions. For example, the project saved $200 million from changes to the South Boston interchange alignment.

2. Savings of $750 million from cost-containment actions. For instance, B/PB helped save $60 million for disposing of 17 million cubic yards of excavated material.

3. Savings of $500 million from reducing the cost of insurance. An owner-controlled insurance program eliminated the need for the contractor or consultant to buy commercial insurance. In conjunction with the Big Dig's excellent safety record, this approach eliminated overlapping coverage and allows MTA to realize economies of scale.

Public officials must balance a variety of factors and have not always accepted B/PB's recommendations for cost control. Two examples:

- B/PB proposed a Purchase Street bypass that would have saved approximately 18 months and, conservatively, more than $100 million; concerns about effects on traffic and opposition from within the neighborhood led MTA to reject the proposal.
- The joint venture proposed not to restore the Dorchester Avenue bridge, which would have saved tens of millions of dollars. MTA reversed its original acceptance after the adjacent U.S. Postal Service regional headquarters objected.

Water Intrusion, Leaks, and Tunnel Walls

The recent controversy over leaks in the I-93 tunnels has raised further questions about possible project cost overruns, schedule slips, and B/PB's performance. The matter has generated enormous public confusion, as ordinary and anticipated construction issues have been wrongly conflated with breakdowns in construction quality control.

There is no room for confusion on one matter, however: At no time has any expert claimed that the tunnels are unsafe. The massive tunnel walls are founded on deep rock and consist of 42"-thick concrete sections that span huge steel soldier piles placed about five feet apart, some with additional rebar reinforcement. MTA has repeatedly stated, and our own engineers have verified, that the tunnels are sound and motorists can use them with confidence. Following a three-month investigation by an expert panel of its engineers, the FHWA officially confirmed on April 4 that "the CA/T is structurally sound and remains safe for traffic."

At least three separate and distinct issues have been widely reported and discussed under the generic rubric of "leaks":

- weather-related water intrusion into the tunnels
- leaks through tunnel walls and roof/wall joints
- construction defects in the tunnel walls

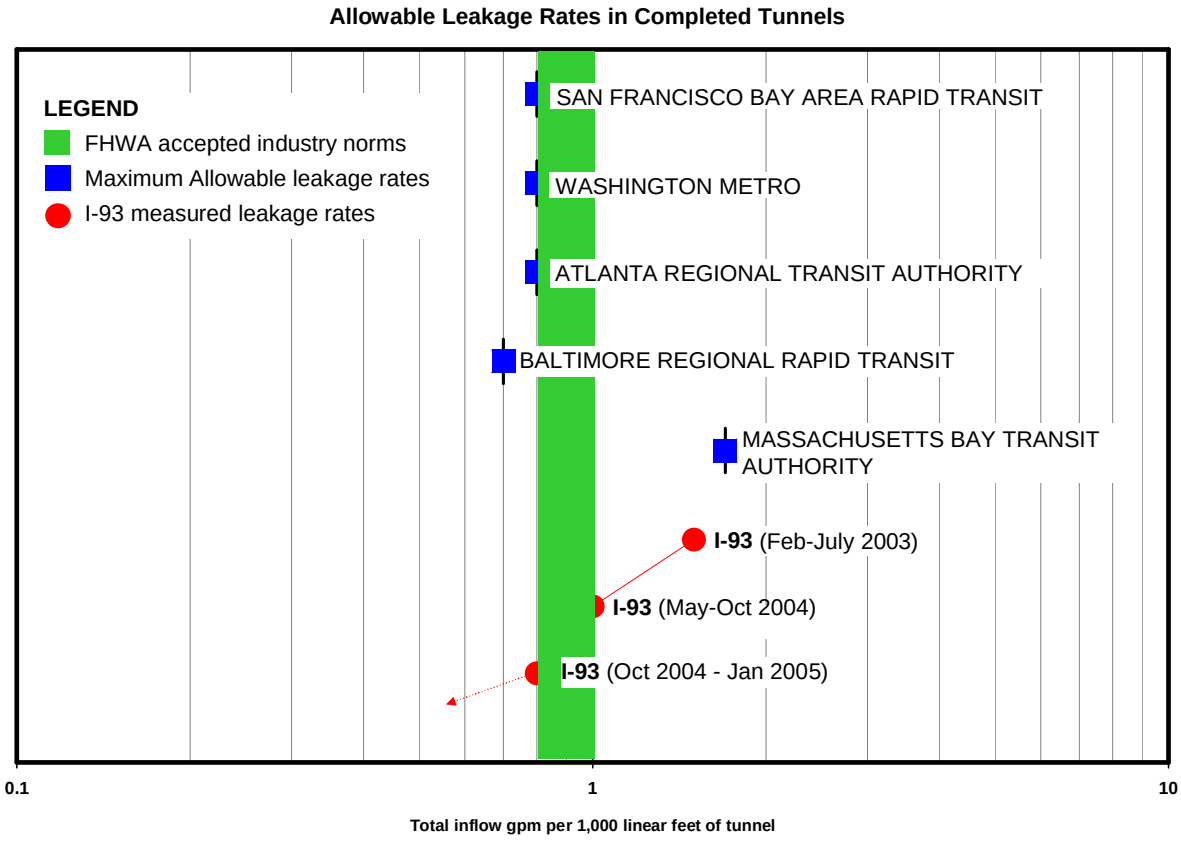
Weather-Related Water Intrusion

As much as half the water entering the incomplete tunnels is simply precipitation that intrudes through openings that remain while construction continues. For instance, water flows down traffic ramps that are still uncovered. There are open holes where underpinning beams that supported the old elevated artery once stood. Manholes and utility conduits must remain unsealed until final cabling is installed. Covering or sealing such pathways is a scheduled part of finishing the project.

Because the Big Dig has recently achieved so many milestone openings, many people have lost sight of the key fact that the tunnels—first opened to traffic in March 2003—are still under construction. Part of the genius behind the original concept of the Big Dig was finding ways to allow construction to progress while keeping the Central Artery open to huge daily traffic flows. That meant opening the tunnels to traffic–safely–long before they were finished. Only later, in the complex staging process to keep the city open, could we bring down the elevated artery, remove the artery supports, and finally close up the roofs of the tunnels.

Fortunately, construction should end later this year. In the meantime, any water still entering the partially opened tunnels is readily managed by permanently installed drains and pumps, which have hundreds of times more capacity than needed to handle the load. Even with the tunnels still under construction, they already conform to industry norms for water intrusion in completed tunnels, as referenced by the FHWA and European engineering bodies. When construction is finished, the I-93 tunnels should surpass those norms (see Figure 2).

Figure 2



Wall and Roof-Joint Leaks

As MTA Chairman Matthew Amorello and Project Director Mike Lewis testified before a state panel in December, project officials understood that sealing leaks would be a normal part of the construction process and that an inspection and maintenance program would be needed during the operational life of the tunnels. The "slurry wall" construction method made it impossible to waterproof the exterior tunnel walls. The state chose this method because it was the only way to build the tunnels wide enough to accommodate eight lanes of traffic to federal highway standards within extremely tight space constraints, without requiring more disruptive construction at street level or more extremely expensive land acquisitions. (Slurry walls have been used successfully to build underground structures and tunnels, such as Bay Area Rapid Transit stations in San Francisco and portions of the Red and Orange subway lines in Boston, for decades.)

In order to minimize inevitable leakage in the tunnels, project construction contracts in the early 1990s directed Big Dig contractors to apply waterproofing materials to the floors and roofs, where joints create opportunities for water intrusion. The waterproofing materials and techniques were selected by the contractors from those standard products acceptable to FHWA. As the project gained experience and reviewed materials performance, FHWA agreed to narrow the

range of approved waterproofing processes in order to use those best suited to contractor skills and specific conditions found on the project.

The basic waterproofing design of the tunnels is sound—as demonstrated by the fact that the majority of wall bays show no sign of leakage. Nonetheless, over the more than five linear miles of tunnel walls, our inspectors have identified hundreds of leaks, mostly from roof-wall joints.

Detecting and sealing inevitable leaks through walls and joints is an integral part of the normal construction process. It takes persistence and patience to block the multiple paths that water under pressure always finds or creates. As MTA's Project Director Michael Lewis put it in testimony last fall, "grouting is the industry standard practice for sealing fissures in concrete after construction. . . . [It] is an element of the construction completion."

To organize the process, B/PB formed a task force in 2000. Based on its direction, contractors responsible for each of the various sections of the tunnels systematically located wet spots and injected high-tech grout under pressure to seal the leaks. As water found new paths through the tunnel walls or joints, those leaks too were sealed. This program succeeded in controlling leaks in two of the first completed sections, confirming the project's approach. Similar methods are now being applied to remaining leaks in the tunnels.

In its March 23, 2005 Interim Report, FHWA found that chronic low level leaks "are to be expected to some degree due to tunnel depth below the water table." More specifically, FHWA stated:

> It should be recognized that the submerged nature of the tunnel system makes it unlikely that intrusion by water can be completely eliminated. The FHWA Tunnel Maintenance and Rehabilitation Manual cites the water intrusion rate that was used in the Bay Area Rapid Transit ("BART") system in California and since adopted by other tunnel owners as a workable criteria. This rate, approximately 1 [gallon per minute] per 1000' of tunnel, offers a practical point of reference to evaluate how successful the project is in achieving the specified requirement for a dry tunnel.

Based on our latest analysis, the current rate of water leakage through the tunnel walls and joints is already 20 percent or more below this industry norm for *completed* tunnels. The rate is expected to decrease further as the leaks program is completed later this year.

As MTA consulting engineers George Tamaro and Jack Lemley both testified in November 2004, and as FHWA experts confirmed this April, the grouting program should be continued. Since the last full inspection of the tunnels in the summer of 2004, the project has ramped up the number of crews devoted to sealing leaks from two to 13. More crews can be added as needed to assure that leaks are properly sealed in time to meet the schedule for substantial project completion later this year. The work is generally done by specialty contractors and is monitored by B/BP to ensure the consistency and adequacy of the grouting effort. The cost of the work will generally be borne by the contractors originally responsible for building the tunnel sections.

Based on a thorough investigation, an independent panel of FHWA engineers reported this April that they are "comfortable with the project's methodical approach" to sealing tunnel leaks. The agency concluded on the basis of their report that "The process for identifying and sealing low-level leaks at the interface of the tunnel roof and wall is effective and should be continued. . . . We expect the sealing operation to be completed by the end of September."

Fireproofing Issues

Repeated freezing and thawing of water leaking from the tunnel roof and wall joints damaged fireproofing materials in several places. At one location, small pieces fell from the ceiling. The compromised material has been removed. About 2,800 square feet of material needs to be replaced out of 1.8 million square feet of fireproofing materials throughout the tunnels. In a statement accompanying the release of its interim leak assessment report in early April, the Federal Highway Administration said, “Sealing the low-level leaks will resolve this problem with the fireproofing material.”

The September 15 Wall Breach

On September 15, 2004, a breach occurred through the east wall of the I-93 northbound tunnel, about 71 feet below the surface at a location under Atlantic Avenue in front of the Federal Reserve Bank Plaza, in one of the deepest areas of the tunnel alignment. Water and sand poured out of a small hole, temporarily flooding two lanes and requiring an extended closure of one lane during peak afternoon traffic before the wall was patched that evening.

This wall breach resulted from a series of construction contractor errors, compounded by inadequate oversight. We at B/PB missed an opportunity to direct the contractor to correct the specific wall problem ahead of time. There is no satisfactory explanation for this. We have publicly acknowledged our responsibility and will pay our fair share of the cost of permanently fixing this portion of the wall. We are working with the contractor and with MTA to implement a long term fix. We are also working vigorously with our own and independent experts to anticipate and avert similar problems.

The conditions that led to the breach were extremely unusual—a combination of improper construction, poor soils, great water pressure at the deepest portion of the tunnel, and a breakdown in the inspection and acceptance procedures normally applied on the project.

A careful investigation showed that the breach was caused by improper construction of a single wall bay next to work by another contractor. The construction contractor failed to follow its own approved procedures, which called for removing an end stop and clearing away dirt and debris trapped by overflow concrete in its section of the wall. This pocket of material (clay inclusion) eventually allowed water—under high pressure at depth—to find a path through the wall and into the tunnel.

Our field engineer noted the construction defect in 1999 but inadvertently failed to issue a deficiency notice directing the contractor to fix it. The contractor identified a leak at the wall location in late 2001 and informed project representatives. Days later, our resident engineer called on the contractor to undertake nondestructive testing to assure that the wall panel met contract specifications, and to submit a procedure for repair.

Although responsibility lies with the contractor to ensure proper construction of the wall, we seriously regret that we did not do more to prevent the September incident. We should have directed the contractor to correct the problem during the initial inspection. Later we should have been more vigilant in making the contractor carry out necessary tests and repairs properly.

Following the wall breach, B/PB worked with engineers from MTA and the contractor, Modern Continental, to identify three permanent repair options. After several months of careful review,

the contractor selected and prepared an option consisting of a concrete-encased, structural steel panel on the inside (tunnel side) of the slurry wall. The new repair panel would extend from the walkway to the roof slab, and 1.5 feet on either side of the damaged slurry wall panel. This option would offer great structural integrity, minimize construction risk to adjacent property, and provide access to install a tight seal along the edges of the replacement wall. A decision by MTA is pending.

To minimize the possibility that similar issues might arise elsewhere, project teams have for several months been conducting extensive physical inspections and a thorough review of records. We have added personnel at our own expense to expedite this process. In addition, we and the state each hired independent experts to ensure the effectiveness of this review process. We made our records available to them.

As of April 13, careful physical inspection of approximately 1,600 tunnel wall panels (about 80 percent of the total) had identified defects in 102 wall panels. Of these, only two (including the panel breached last September) require major repairs. 33 panels require modest repairs and 67 will need only minor repairs. Repairs were complete on 10 panels and underway on 6 more. They will all be repaired at no cost to the public or to the project.

These issues are being resolved without delaying project completion. After thoroughly reviewing the facts, an independent panel of FHWA engineers recently concluded that “The September 15, 2004 Slurry Wall Breach appears to be isolated to a discrete section of the tunnel and primarily the result of poor quality control during construction. The project has successfully installed an interim repair and is actively designing the permanent fix while completing an investigation of all suspect slurry wall panels.”

Tunnel Maintenance

As former MTA consulting engineer George Tamaro has noted, and an expert panel convened by the FHWA recently confirmed, all tunnels built below the water table inevitably experience some seepage, even when complete (see Figure 2). In Boston alone, leaks can be observed in such underground projects as the Red Line, North Station, Port Office Square, and the recently opened Seaport Hotel Garage.

Even after the I-93 tunnels are complete and existing leaks are sealed, some new seeps will almost certainly appear over time. They will be detected and sealed as part of a normal maintenance program, as with all tunnels. An Inspection Manual for Tunnels and Boat Structures has been prepared and submitted to the Massachusetts Turnpike Authority to provide assistance. The cost of this maintenance program should be well within the expected range, given the tunnels’ length, their structural steel roof system, and the extent of their sophisticated traffic management and safety systems.

Visual inspections in areas of the tunnels where water leakage has been most significant have uncovered no significant corrosion issues. In general, the applied coating systems are providing adequate corrosion protection to the structural steel elements. There is no danger of joint failure assuming a level of maintenance standard for this type of structure. With proper inspection and maintenance, including continued attention to metal coatings, the tunnels should provide many decades of excellent service.

Conclusion

Bechtel/Parsons Brinckerhoff is proud of its role in helping the Commonwealth of Massachusetts manage one of the largest, most complex, and technically challenging infrastructure projects in U.S. history. In the course of successfully meeting those challenges, and responding to a multitude of public concerns and interests, the project has changed in myriad ways over the past quarter century, delaying its completion and increasing its cost. Through innovative engineering and management, we helped the state control costs and schedule, saving taxpayers hundreds of millions of dollars and bringing benefits more quickly to Boston-area motorists and residents.

The economic benefits to the region during construction have been enormous, and will continue long into the future. When complete later this year, the downtown Central Artery (I-93) will be capable of carrying 245,000 or more vehicles a day comfortably, far more than the old artery and without its infamous traffic jams. In addition, the Ted Williams Tunnel can carry more than 90,000 vehicles a day. By cutting downtown traffic congestion, residents and businesses will enjoy benefits estimated at about $500 million a year. That figure is based on lower accident rates, less wasted fuel from engines idling in stalled traffic, and reduced late-delivery charges. The health benefits should also be substantial, starting with a 12 percent reduction in carbon monoxide levels.

Property values in downtown Boston are soaring as the Big Dig reconnects neighborhoods severed by the old elevated highway and improves the quality of urban life beyond the limited confines of the new expressway. When the crumbling elevated roadway is fully demolished, it will be replaced by open space and modest development. The project will create more than 260 acres of open space, including 30 acres where the existing Central Artery now stands, more than 100 acres at Spectacle Island in Boston Harbor (where project soils are capping an abandoned dump), and 40 more acres of new parks in and around downtown Boston. The Central Artery is the first step toward an exciting urban renaissance.